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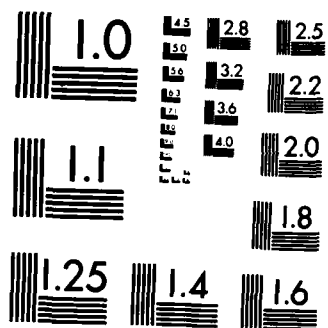
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TECHNICAL REPORT NO. 104



AD-A153 117

THE LONG-RANGE ROLE AND
MISSION OF INSTRUCTIONAL
PROGRAM DEVELOPMENT
CENTERS: PRODUCTIVITY
IMPROVEMENT

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ORLANDO, FLORIDA 32813

TAEG Report No. 104

THE LONG-RANGE ROLE AND MISSION OF INSTRUCTIONAL
PROGRAM DEVELOPMENT CENTERS: PRODUCTIVITY IMPROVEMENT

C. L. Morris, Jr.

Training Analysis and Evaluation Group

June 1981

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- . made recommendations for implementation and provided supporting rationale for the productivity measures identified
- . organized the productivity enhancement recommendations in a format suitable for use as a data base to support the development and implementation of a long-range Naval Education and Training Command IPD plan. *Key note*

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SECTION I

INTRODUCTION

The Training Analysis and Evaluation Group (TAEG) was tasked by the Chief of Naval Education and Training (CNET) to conduct a study of the long-range role and mission of the Instructional Program Development Centers (IPDCs).¹ The tasking requested TAEG to review the original "A Plan for the Centralized Management of Instructional Systems Development (ISD) Within the Naval Education and Training Command"² (commonly referred to as the "Blue Book") and assess progress to date. It was further requested that the concept of the IPDC network be analyzed and extended to include all activity relating to "A," "C," and "F" Schools under CNET cognizance. The effort envisaged included assessing IPDC and school development capabilities and developing recommendations for integrating these capabilities into a coordinated command-wide IPD program.

A two phased study was initiated. Phase I presented an analysis of IPD productivity from July 1976 to September 1980 which covers the period from initial activity at IPDC San Diego to the latest accounting period prior to report preparation. Productivity data for IPD activity relating to 28 courses were examined in detail for this period and recommendations for productivity improvement were proposed. The results of this effort were published by Swope and Keeler (1981).

Phase II assessed current IPD management and operational practices and examined existing organizational structures. Based upon this assessment and an in-depth study of productivity measures, a number of recommendations for enhancing IPD productivity were developed. The present report describes this effort.

PURPOSE

The purpose of the present study is to:

1. identify functional areas within the IPD program to which productivity enhancement measures can be applied
2. make recommendations for implementation and provide supporting rationale for the productivity measures identified
3. organize the productivity enhancement recommendations in a format suitable for use as a data base to support the development and implementation of a long-range CNET IPD plan.

¹CNET N-53 ltr of 21 Feb 1980, subj: Tasking for a study of the long-range role and mission of Instructional Program Development Centers (IPDC's).

²Chief of Naval Education and Training Support memorandum 01A:ELL of 11 August 1975, subj: Plan for the Implementation of ISD in NAVEDTRACOM.

SECTION II

BACKGROUND AND APPROACH

BACKGROUND

A study group was established in January 1975³ by the then existing Chief of Naval Education and Training Support (CNETS) to develop a concept of operations for implementing a centrally managed Instructional Systems Development (ISD) program. The concept of operations developed by the study group was presented to the CNET during May 1975. He judged the plan of centralizing ISD at one location inefficient. The CNET subsequently provided guidance which called for revising the initial concept. This guidance suggested centralizing ISD management and decentralizing development. Based upon this guidance, CNETS reconvened the study group to develop a revised plan which would provide for dispersion of the program development function while maintaining effective centralized program management. "A Plan for the Centralized Management of Instructional Systems Development (ISD) Within the Naval Education and Training Command" was developed in accordance with the revised guidance and was submitted to CNET for approval in August 1975. The plan was approved in concept by CNET in September 1975 and implementation was directed. This plan then became the basis for implementing the ISD program.

The "Blue Book," although well conceived in 1975, has become outdated. The TAEG was tasked to reexamine the long-range role of IPDCs in support of the CNET command-wide IPD mission. In addition, the CNET Assistant Chief of Staff for Training Systems Management expressed a desire to develop an updated long-range command-wide IPD plan. The recommendations proposed in this study are intended to support this planning effort.

APPROACH

A three-step process was employed in developing this study.

Initially, a data base was developed utilizing inputs from current ISD directives and instructions and recently published CNET/TAEG documents. The documents having the greatest relevancy during this development are Hodak, Middleton, and Rankin (1979); Swope and Keeler (1981); and NAVEDTRA 110 (1978). Next, interviews with key IPD personnel at both the management and operations level provided a substantial range of information. Information gathered from about 60 IPD practitioners provided necessary current expert opinion in a real-world setting. Finally, a framework was developed for identifying and presenting a number of recommendations for IPD productivity improvement. These recommendations are presented in detail in section III of this report. The major functional categories for the series of recommendations presented are:

³CNETS memo 00 of 6 January 1975, subj: Concept of operations for implementing centrally managed ISD; development of

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- . CNET Policy
- . Organizational Structure
- . Management and Operations Practices
- . New Technology

Specific issues requiring resolution are subsumed under each of these categories. Recommendations are grouped in terms of these specific issues. Each recommendation, as shown below, is accompanied by supporting rationale.

- . CNET Policy
 - .. CNET IPD Role in Navy Training Plan Development
 - .. IPD Prioritization for All "A," "C," and "F" Courses
 - .. IPD Planning, Programming, and Budgeting
 - .. Assessment of IPD Need Prior to Development
 - .. Resource Expenditure, Measurement, and Tracking
 - .. Internal Training Effectiveness Evaluation.
- . Organizational Structure
 - .. IPDC Organizational Structure
 - .. School IPD Organization
 - .. CNET IPD Staff Management Organization.
- . Management and Operations Practices
 - .. Planning System
 - .. Personnel Selection, Training, and Certification
 - .. IPD Needs Determination
 - .. IPD Resource Programming and Budgeting
 - .. Course Development/Maintenance Prioritization and Tasking
 - .. IPDC/CISO/School Program Integration and Coordination
 - .. IPD Design, Development, and Implementation
 - .. Course Level Validation and Validation Verification
 - .. Training Effectiveness Evaluation
 - .. Management Information System
 - .. Productivity Measurement and Evaluation System.
- . New Technology

A post note to the study presents an overview of policy relating to planning and management control. The post note highlights the importance of planning and demonstrates the interrelationships and interdependencies among planning, implementation, measurement, and control.

SECTION III

RECOMMENDATIONS AND RATIONALE

This section presents a series of recommendations with supporting rationale for enhancing IPD productivity. These measures for increasing program effectiveness are intended to support the development of CNET policy and planning for the efficient implementation of a command-wide IPD program. Because of the nature of the recommendations presented (wide-range of subject matter affecting many functional areas) rapid and concurrent implementation could be detrimental to development programs in process. This possibility should be considered during the development of a long-range plan. The proposals herein are presented within the framework developed in section II of this report (p. 6).

CNET POLICY

The recommendations presented relate to CNET long-range goals and objectives for the ISD program. The underlying objective for the issues addressed herein is to support these goals and objectives by modifying current policy and guidance to be more explicit and relevant.

CNET IPD ROLE IN NAVY TRAINING PLAN DEVELOPMENT. Establish policy which assures CNET IPD personnel participation in Navy Training Plan development.

During the Navy Training Plan development process a conceptualization takes place which provides a basis for establishing future training system requirements. The training systems developed to satisfy these requirements must be supportive of the weapons systems to which they relate and should utilize state-of-the-art training technology. The increasing sophistication of weapon system and training system technology requires professional expertise in the decision-making process. This expertise is being provided at the weapons system development level. However, it is often overlooked at the training plan development level, due to differences in the perceived importance of operational systems and training systems.

Establishing a requirement for IPDC instructional technologists to participate in training plan development would assure representation by training professionals. It would also provide to these professionals an appreciation of Fleet training problems relating to new weapon systems. Additionally, it would serve to identify prerequisite core training requirements relating to the training plan under development. Although scarce personnel resources would be required to take this recommended action, it is proposed that the benefit gained would more than offset the cost of resources expended.

IPD PRIORITIZATION FOR ALL "A," "C," AND "F" COURSES. Establish a single IPD prioritization policy for all "A," "C," and "F" courses. This prioritization policy would insure a balance between economic factors and critical need factors in the selection of courses for development. It would also provide a basis for including all CNET training programs in the prioritization process.

During the process of allocating scarce resources to IPD projects, it becomes necessary to prioritize development activity on the basis of benefit and cost. The prioritization system which has evolved for this purpose appears to be weighted heavily in favor of return on investment. If this return were measured in terms of Navy effectiveness, a problem would not exist. However, this is not the case. Under the existing system it is likely that a high throughput "A" School would be selected for IPD over a critical need "C" or "F" School. This might or might not lead to greater Navy effectiveness since training criticality is not considered.

All "A," "C," and "F" courses require periodic program development and maintenance and most are under CNET cognizance. However, there are not sufficient development and maintenance resources to apply to all 3,000+ courses requiring support, and it is likely that this situation will not change in the near term. Consequently, a need exists to establish a policy which will assure a periodic curriculum effectiveness review of all Navy training under CNET cognizance to assure proper allocation of limited resources. A prioritization policy requiring a periodic review of all training under CNET cognizance should help to alleviate a situation in which critical need development is often overlooked.

IPD PLANNING, PROGRAMMING, AND BUDGETING. Develop a specialized Planning, Programming, and Budgeting System (PPBS) policy for IPD programs which would allow for flexibility in the programming, budgeting, and allocation of IPD resources.

Because 2- to 3-year lead time is often not possible in the IPD process it is suggested that IPD PPBS policy be modified to allow for block funding within investment appropriations. Although OPNAV support would most likely be required in formulating and obtaining approval for a system with this flexibility, an action of this type is considered justifiable.

The PPBS within the Department of Defense (DOD) has provided a degree of program visibility in support of decision making which did not exist prior to its implementation. For this reason, PPBS implementation has been considered a major step forward in DOD program management and control. However, when applied in support of IPD within CNET, it becomes a significant obstacle to the efficient execution of IPD programs. The reason for this situation is primarily one of projecting IPD need 2 to 3 years in advance of implementation and, more specifically, one of identifying types of training equipment to be applied prior to the conduct of a training analysis. It has been demonstrated many times, both by CNTECHTRA and IPDCs, that programming for investment training items 2 or more years in advance of need is, at best, an expert guess. Many approaches have been attempted to minimize this problem, but none have been successful. The best was the development of generalized planning wedges which allowed for entry into the programming process. The artificiality of this approach, although well intended, does not provide sufficient justification during the POM review process. This can result in greater penalties for IPD than rewards.

Because of the nature of investment appropriations (OPN, APN, SCN), CNET cannot program for block funding in these categories. It is, therefore,

suggested that action be taken at the OPNAV level to explore programming alternatives for IPD investment items in order to alleviate a problem which could become very serious.

ASSESSMENT OF IPD NEED PRIOR TO DEVELOPMENT. Establish policy for determining and documenting IPD need at the course level prior to initiating design and development activity.

The experience gained to date on Navy IPD programs indicates that resource expenditure per hour of instructional program development is significant. It is also noted that total course development tasking is initiated without first assessing if only a portion of a curriculum (such as a phase of instruction) is deficient and in need of development. This sometimes results in curriculum development involving hundreds of hours of instruction as opposed to development of a phase which might involve 50 hours or less. The continuation of this tasking and development approach could result in development expenditures greatly in excess of actual need.

The course of action recommended above would require an assessment and documentation of development need prior to tasking for design and development. In essence, this policy would assure that resources are utilized to make bad instruction good as opposed to making good instruction better. In this way critical need will be identified and addressed prior to noncritical need.

RESOURCE EXPENDITURE, MEASUREMENTS AND TRACKING. Install procedures for measuring and tracking resources expended during all instructional program development and maintenance activity within the CNET command.

The expenditure of CNET-controlled resources for IPD is not readily determinable. A resource expenditure and accountability system for IPDC programs was implemented in 1976⁴ and, although many imperfections are apparent in this system, it provides reliable information on a limited scale. Progress has been made in the development of IPD management systems since the implementation of formalized IPD activity within the CNET command, and management control systems continue to improve. However, resource expenditure is not controlled effectively because a command-wide IPD resource expenditure tracking system does not exist. IPD activity is somewhat unique and the differentiation between IPD activity and other activity within the Command is not readily determinable. This makes measurement very difficult. In addition, there is some strong sentiment that resource expenditure measurement and tracking for IPD would cost more than its worth. This line of reasoning does not appear justifiable. The magnitude of IPD expenditures and the productivity levels being achieved indicate that an effective measurement and tracking system could be of significant benefit.

⁴CNET SUPPORT Instruction 7400.1 of 27 June 1978, subj: Man-Hour Accounting for IPD; Policy and Procedure for

INTERNAL TRAINING EFFECTIVENESS EVALUATION. Conduct internal Training Effectiveness Evaluation (TEE) for selected training programs developed in accordance with ISD guidelines. The selective application of this TEE capability would be used in conjunction with resource expenditure information to develop benefit-to-cost measures.

All of the CNET 3,000+ training courses were developed in accordance with some systematic development process and all require periodic updating throughout their life cycle. This development and maintenance activity accounts for significant resource expenditures, the magnitude of which has not been quantified until recent years. The formalization, control, and accountability of the instructional program development process within CNET has provided a documented information base upon which IPD resource allocation decisions are made. However, there is one essential element of management information missing--a measure of training program effectiveness. CNET policy does not require a pre- and post-IPD effectiveness evaluation. Without this measure of training effectiveness, it is not known if an updated course is less effective than, equal to, or more effective than, the original course in satisfying training objectives. Consequently, it is not possible to develop a management control system which will assure efficient allocation of resources in support of training effectiveness improvement.

The policy recommended above would allow for the selective application of internal TEE to the extent that it would be supportive of the IPD mission. Although the ultimate evaluation is in the operational environment, it is not expected that IPD TEE be extended to this level. The TEE recommended above relates to the effectiveness of training provided as measured in the school at the completion of training. This would, in essence, certify that the updated course of instruction is effective in satisfying the course training objectives to a greater or lesser degree than the original course. This would then provide a basis for management action to assure IPD training program cost effectiveness.

ORGANIZATIONAL STRUCTURE

The organizational structure recommendations contained in this section evolved from the team concepts in Hodak, Middleton, and Rankin (1979), the need to reduce overhead as identified in Swope and Keeler (1981), and the many organizational recommendations offered by key IPD personnel.

The organizational structures proposed in this report are not intended to be in a form ready for staffing. They are proposed only as conceptual organization models intended to be consistent with other IPD recommendations such as team structuring, matrix support, reduction of indirect charges, and productivity-related measures.

ORGANIZATIONAL STRUCTURE. The model IPDC structure (figure 1) is an organizational guideline for Navy IPDC organizational development.

The organizational structure shown in figure 1 provides many of the desirable characteristics of an IPD organization as identified in Hodak, Middleton, and Rankin (1979) and Swope and Keeler (1981). There is a single team management function subordinate to the IPDC director, and team

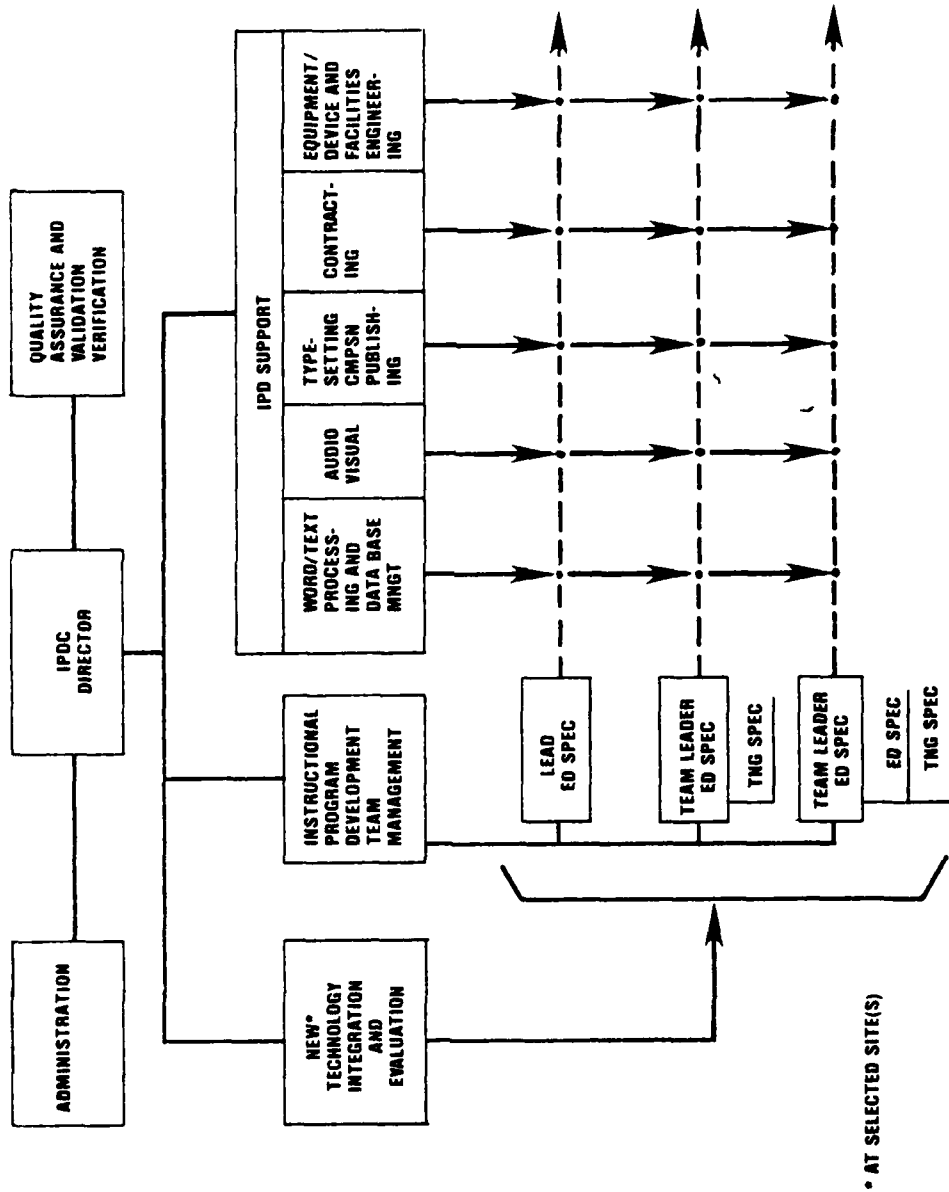


Figure 1. IPDC Organizational Structure

leaders are participating educational technologists. This organizational arrangement reduces layering of management and provides project team leaders with the necessary authority and responsibility for development programs under their cognizance.

The matrix approach to providing support services allows for support of many concurrent programs and for effective management planning and control. This support concept can also be extended to provide support services for school-managed IPD programs as described in the School IPD Organization section of this report.

The new technology integration and evaluation section, which would typically consist of one to five or six personnel, will provide new technology expertise during the introduction of new applications such as computerized typesetting, computer based instructional delivery, and computer aided authoring. It is intended that the new technology specialists would integrate with a development team in new technology implementation. In this way the risk normally associated with new technology applications should be significantly reduced.

The administration and quality assurance staff functions would not change significantly. The only change recommended is for the evaluation function of the quality assurance office to be limited to validation verification. Validation should be a team leader responsibility with third party verification a quality assurance responsibility. Under this operational arrangement, a small one or two person evaluation office could support many development programs.

SCHOOL IPD ORGANIZATION. Utilize the proposed school IPD organizational structure (figure 2) as an organizational guideline in developing school-based IPD capabilities.

The school normally participates in instructional program development conducted at IPDCs. However, the IPDCs do not normally actively participate in development or course update projects accomplished at the school by school personnel. The school IPD organization shown in figure 2 would provide for a formalization of school managed IPD using support services provided by the IPDC. These support services would be provided in the same way they are for IPDC projects. Consequently, there would not be a requirement for IPD restructuring. Most likely, there will always be a problem of insufficient school and IPDC resources, but this organizational approach should help alleviate the problem within the limit of available resources. There is a continuing need to maintain currency for all CNET training programs. The school IPD organization shown, supported by IPDCs, would allow for improved responsiveness to this requirement.

CNET IPD STAFF MANAGEMENT ORGANIZATION. Utilize the structure (figure 3) as an organizational guideline in configuring CNET staff management in support of command-wide IPD.

The proposed CNET IPD staff management organization shown in figure 3 is very similar to the current organization. The only changes suggested relate

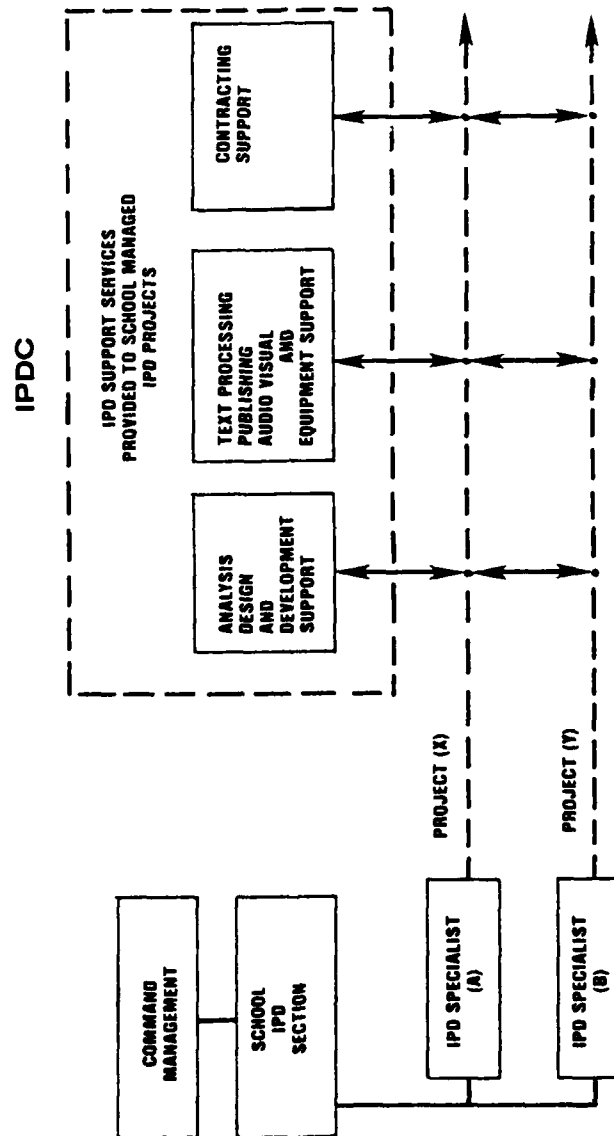


Figure 2. School IPD Organization

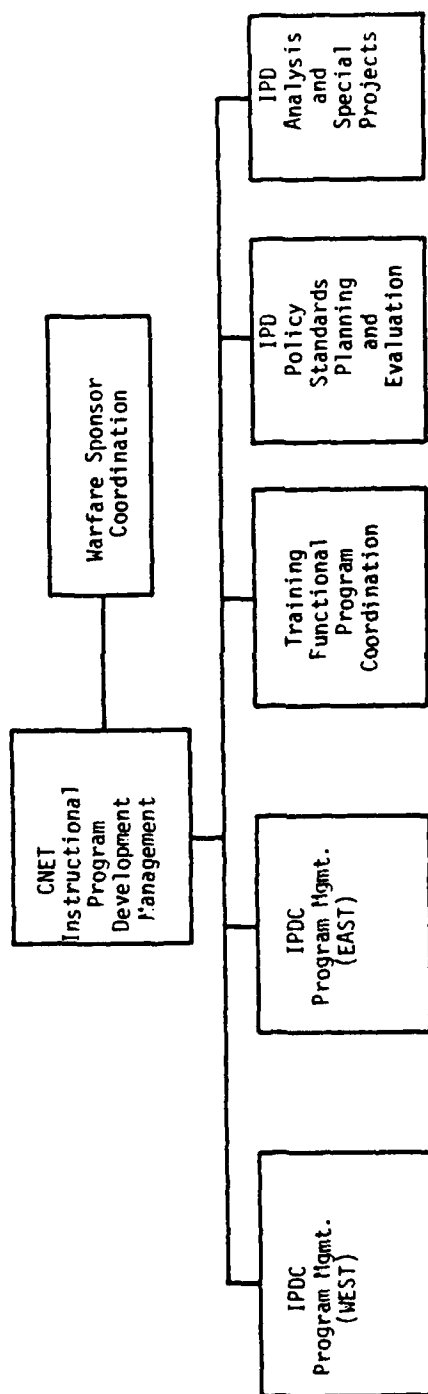


Figure 3. CNET IPD Staff Management Organization

to greater organizational emphasis on policy, standards, planning, and evaluation and to formalizing Training Functional Program Coordination. IPD personnel have suggested that CNET policy and standards capabilities should be expanded and operations management functions should be reduced. The organizational structure shown satisfies this goal.

Implementing a command-wide IPD policy will require increased CNET/training functional IPD interface, particularly for "C" and "F" course development. The organization shown provides a Training Functional Coordination section for this purpose.

Other staff functions remain essentially the same. It is not envisioned that CNET staff expansion would be necessary for the organization shown beyond the one or two specialized billets needed for added organizational functions.

MANAGEMENT AND OPERATIONS PRACTICES

The recommendations for improving management and operations practices discussed in this report were initially described in Hodak, Middleton, and Rankin (1979) and Swope and Keeler (1981). Based upon these suggestions for productivity enhancement, comments were solicited from key IPD personnel regarding feasibility. The responses indicated that most of the recommendations appeared feasible and that some were already under consideration for implementation.

The recommendations proposed in the remainder of this section relate to operating procedures and address the need to prepare instructions, publish handbooks, and establish standard practices which relate to and support CNET IPD policy. Following each recommendation, related comments are provided which highlight content areas wherein productivity improvement is possible.

PLANNING SYSTEM. A number of plans have been developed for IPD since the approval of the original master plan in August 1975. These plans have included long-range, mid-range, and short-range plans for approximately 25 instructional program development projects and, additionally, many IPDC support projects. Because there is little consistency among the plans in terms of content or format, each project plan is essentially unique.

It is suggested that a standardized planning system be developed and proceduralized for command-wide IPD which could be used effectively to support resource programming and management control. This system would incorporate global or master planning at the CNET level, mid-range planning at the IPDC level, and short-term project planning at the project level. This integrated planning system should be supportive of CNET master planning objectives, and each planning level should provide for the rapid incorporation of approved changes.

PERSONNEL SELECTION, TRAINING, AND CERTIFICATION. Personnel selection and training are necessary functions in support of formalized IPD within CNET. However, standards and procedures specifically addressing these IPD functions have not been developed. Therefore, it is suggested that an instruction be developed and promulgated for all IPD occupational series specifying selection

criteria, training requirements, and certification standards. Although an instruction of this type will not bring about short-term improvement, it will provide a baseline document from which a personnel selection, training, and certification system can evolve.

IPD NEEDS DETERMINATION. The requirement for IPD needs assessment is becoming increasingly evident. Tasking and management control cannot be effective if IPD need is unknown. When the results of preanalysis, which specifies what should be trained, are compared to the curriculum which describes what is being trained, a training deficiency (need) or training excess (no need) results. This need should be documented prior to design and development tasking for effective program control. It is suggested that a procedure for this process be developed and distributed for use on all IPD programs within the CNET command.

IPD RESOURCE PROGRAMMING AND BUDGETING. The DOD PPBS has proven its worth as an effective management planning and programming system for weapons system planning and acquisition. It can also be used effectively for any type of PPB activity in which long-range needs can be identified and specified. However, when applied in support of IPD projects, it can severely restrict the IPD options available to the development agent. This topic has already been discussed in this report under CNET policy recommendations.

The IPD resource planning, programming, and budgeting procedure addressed here is intended to provide a systematic method for identifying long-term needs for future IPD programs. With this assessment of future need, generalized planning wedges can be entered during the POM process to be further defined during the budget process. Although this generalized submission is not desirable, it is the only available option within the current system. Consequently, it should be proceduralized and documented for use by all IPD activities. It does not provide a long-term solution to the problem but it should provide a limited means of replacing and adding to the capital base of training equipment which is in a serious state of erosion.

COURSE DEVELOPMENT/MAINTENANCE PRIORITIZATION AND TASKING. The primary factor considered to date in the prioritization of IPDC projects is course throughput. If student hours trained and payback were the only factors of importance to the Navy, this might be the preferable way to continue. However, this approach would lead to satisfactory development and maintenance of large throughput courses such as "A" schools, but smaller throughput courses such as "C" and "F" schools would eventually become seriously outdated.

The suggested solution to this problem is to develop and publish a prioritization and tasking procedure for all courses under CNET cognizance. This procedure should consider such factors as course criticality, impact on fleet effectiveness, time since last revision, and other related non-throughput considerations. This prioritization process should be managed by a single office, and an interface should be maintained with all training functionals during the prioritization process. Prioritization in an environment of limited resources is difficult and a system for maintaining balance in

resource allocation is even more difficult. However, some systematic prioritization procedure is required if there is to be an equitable distribution of IPD resources throughout the command.

IPDC/CISO/SCHOOL PROGRAM INTEGRATION AND COORDINATION. During the execution of an IPD project there is a continuing requirement for IPDC and school personnel interface and coordination. This requirement is equally valid for IPDC-managed programs or school-managed IPD programs supported by an IPDC. Currently, memos, letters of understanding, and instructions address portions of this requirement for specific phases of IPD (SME support, programming and budgeting, life cycle support). However, it is suggested that a single CNET instruction be prepared which identifies the coordination required for IPD projects. This instruction would also specify coordination practices to be followed. It is likely that an instruction of this nature would lead to a more efficient integration and utilization of command-wide IPD resources.

IPD DESIGN, DEVELOPMENT, AND IMPLEMENTATION. Procedures for IPD design, development and implementation were initially promulgated within CNET as NAVEDTRA 110 (1978). These procedures were intended to be an extension of NAVEDTRA 106A (1975) and were to prescribe CNET policy, procedures, and guidelines for the analysis, design, and development of NAVEDTRACOM instructional programs. These procedures, although very useful as a supplement to NAVEDTRA 106A, did not sufficiently describe IPD practices to be followed at the working level. Consequently, CNET (N-9) initiated a program for the restructuring and update of this document. This effort is scheduled to be completed during 1981.

COURSE LEVEL VALIDATION AND VALIDATION VERIFICATION. During the normal processes involved in program development, there is a requirement to validate new or updated instructional material in terms of requisite training objectives. This validation, performed by the development team, is of primary concern to three parties--the IPD development team, IPDC and CNET management, and school management. In order to provide validation assurance to these parties, it is suggested that an instruction be prepared which requires a formal validation verification. This instruction would require IPD validation verification by the IPDC evaluation office and the school CISO. Copies of the verified validation results could then be distributed to IPDC, CNET, and school management advising that the instructional material has been validated and is suitable for training. This procedure would provide the necessary assurance to CNET and school management that revised training programs satisfy the training objectives developed during the training analysis phase.

TRAINING EFFECTIVENESS EVALUATION (TEE). For selected courses, it is suggested that training effectiveness be evaluated before and after IPD treatment. Without this evaluation, it is difficult to determine if newly developed instructional material is superior to the existing instructional material. The ability to determine improvement in training effectiveness is necessary for the long-term justification of IPD resource expenditure. Therefore, standardized procedures are needed for this evaluation process. It is suggested that TEE instructions and procedures for internal evaluation be prepared and promulgated to satisfy this requirement.

MANAGEMENT INFORMATION SYSTEM. Although management information is currently provided to IPD managers, a number of comments by key IPD personnel suggest that the information is inadequate in some cases and not needed in others. Since managers can not effectively manage without feedback information, it is suggested that two actions be initiated. The first would consist of an analysis of management information needs. If it is demonstrated that certain information is not necessary for management decision making and control, it should not be included as required management information. Conversely, if a demonstrated need exists, it should be included as required information. These information elements should be identified for each management level from team leader to CNET staff. The second action would consist of the design, development, and implementation of a management information system which would provide the required management information. This information should be timely and in a format suitable for use at all management levels.

PRODUCTIVITY MEASUREMENT AND EVALUATION SYSTEM. It was noted in Hodak, Middleton, and Rankin (1979) and Swope and Keeler (1981) that IPDC productivity was below that which should be reasonably expected. Because of these findings, the present study was specifically directed toward identifying productivity enhancement measures.

CNET IPD management can not currently track productivity effectively because of the inadequacy of the system used. It is proposed that a productivity measurement and tracking system be developed. It is also proposed that a productivity measurement and tracking system procedures manual be developed and published for command-wide application.

NEW TECHNOLOGY

The productivity enhancement measures discussed in prior sections of this report have a common weakness. They address policy, organization, and operations issues which can not be evaluated in a quantifiable form. As an example, it appears that decreasing indirect effort and increasing direct effort on IPD projects would enhance productivity. However, there is not sufficient evidence to state with confidence that this will be the case. Management consensus, management information data analysis, and generally accepted management practices have been utilized in developing the recommendations herein but operational implementation and evaluation will be the only true test of productivity enhancement.

New technology measures are not subject to this same uncertainty. For most cases recommended, there have been numerous applications in the public and private sector wherein productivity improvement has been demonstrated. The primary risk areas in the application of new technology are those associated with resistance to change, selection and training of qualified personnel, and integration with existing systems. For this reason, the IPD organizational structure recommended includes an organizational function for new technology integration and evaluation. It is envisioned that an organizational unit such as this would consist of personnel with advanced technology experience and an educational background in instructional technology, experimental psychology, and/or computer systems hardware and software engineering.

The new technology applications being considered as recommendations are primarily computer based because this is currently the major new technology thrust. These recommendations include instructional development, instructional management, and instructional delivery applications in areas such as text/data processing, typesetting, digitized graphics, authoring, simulation, and testing. Because of the scope of the effort required for the identification, specification, and justification of new technology initiatives, and because of the "stand alone" nature of the subject matter, new technology applications should be addressed as a separate study. An outline of topics suggested for this study include:

- . New Technology Integration and Evaluation Section at Selected Location(s)
- . Computer Communications and Network Standards
- . Computerized Data Base Management
- . Computerized Word/Text/Data Processing
- . Computerized Typesetting
- . Digitized Graphics
- . Computerized Readability Analysis
- . Computer Aided Authoring
- . Computerized Instructional Delivery
 - .. Text
 - .. Still Graphic
 - .. Animation
 - .. Simulation
- . Computerized Interactive Testing
- . Computerized Instructional Systems Management.

POST NOTE

This report and its companion report (Swope and Keeler, 1981) are intended to be used by CNET management as a data base to support the development of long-term CNET IPD strategy and goals. This CNET effort should result in a long-range master plan for the IPD program which incorporates "A," "C," and "F" course development. It should also incorporate a system for integrating the planning process into the total management control process.

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The operational system, at the IPDC level, should be designed to implement short-range plans which are separate yet related subsets of the master plan. The design of this implementation system will be of primary importance in the achievement of greater productivity. The policy, organization, and operations recommendations presented in this report should result in productivity enhancement. However, many are long range in nature. For short-range payoff, it is suggested that initial emphasis be placed on personnel selection and training, the application of production management techniques, and the implementation of a system for output measurement and tracking. Although a comprehensive plan should assure results if well conceived and effectively implemented, personnel qualifications and management control mechanisms are essential. Deficiencies in these areas can offset potential benefit to the degree that planning serves no useful purpose. Consequently, it is suggested that planning and implementation be considered as complementary activities during the development of policy and procedures for CNET IPD.

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